

PERCY SLADEN MEMORIAL EXPEDITION
IN SOUTH-WEST AFRICA, 1908-9.

I.

THE Percy Sladen Memorial Expedition was the outcome of a recent study of *Welwitschia*, that most remarkable of West African plants. Its primary object



FIG. 1.—A view across the Orange River near Raman's Drift, looking North. The river itself is concealed by the lowest zone of vegetation.

was the investigation of the biology and morphology of *Gnetum africanum*, the only immediate relative of *Welwitschia* known to occur south of the Congo. It was further proposed to examine, so far as circumstances would allow, the flora of the desert-belt and of the regions adjacent to it. The expedition was under the auspices of the trustees of the Percy Sladen Memorial Fund, and was assisted by a grant of 200l. from the Royal Society. During the first section of the journey (Cape Town to Lüderitzbucht) I was fortunately able to travel in company with the magnetic survey expedition of the Carnegie Institute under my colleague, Dr. J. C. Beattie. A saving of half the ordinary cost of transport was thus effected. The route followed was very largely determined by the distribution of the usually widely separated water-holes. What would certainly have proved a very interesting part of the journey (viz. from Keetmanshoep to Windhuk) had to be abandoned owing to the necessity of arriving in central Angola before the end of the season in which suitable stages of the ovules of *Gnetum* were likely to be obtainable.

Leaving Ceres Road Station on November 26 with a waggon drawn by twenty oxen, we ascended to the Ceres Plateau (1100 feet) through Mitchell's Pass in the Langeberge Range, and travelled for four days over an undulating tableland rising to 2500 feet, the flora of which is closely related to that of the mountainous districts of south-western Cape Colony. Unfortunately, most of this country was suffering from drought, and the botanical results were poor. At Karoo Poort we suddenly emerged upon the western tongue of the Karoo (November 30), which was crossed in six days. Here also the ground was parched; in some districts, it was stated, no rain had fallen for four years, and many of the farmers had migrated with their families and flocks into Bushmanland and other more favoured localities leaving their homesteads unoccupied. Over large areas all the non-succulent vegetation had disappeared and the flora consisted almost entirely of *Augea capensis* with a few species of *Mesembrianthemum*. Ascending the Blauwkrantz Pass in a spur of the Roggeveld Range on December 6, we came upon a plateau the flora of which is closely related to that of the Nieuveltdt Mountains in the neighbourhood of Beaufort West. On December 10 a somewhat sudden descent to 1600 feet brought us again into a karoid region, in which

species characteristic of the dry, low-lying plateaux of Great Namaqualand were encountered for the first time. Prominent among these were *Tamarix articulata*, *Aloe dichotoma*, *Statice scabra*, *Galenia articulata*, *Didelta annua*, *Exomis albicans*, and *Vogelia africana*. This southern extension of the flora of tropical and subtropical Namaqualand seems to be confined to sheltered valleys at elevations not exceeding 2000 feet.

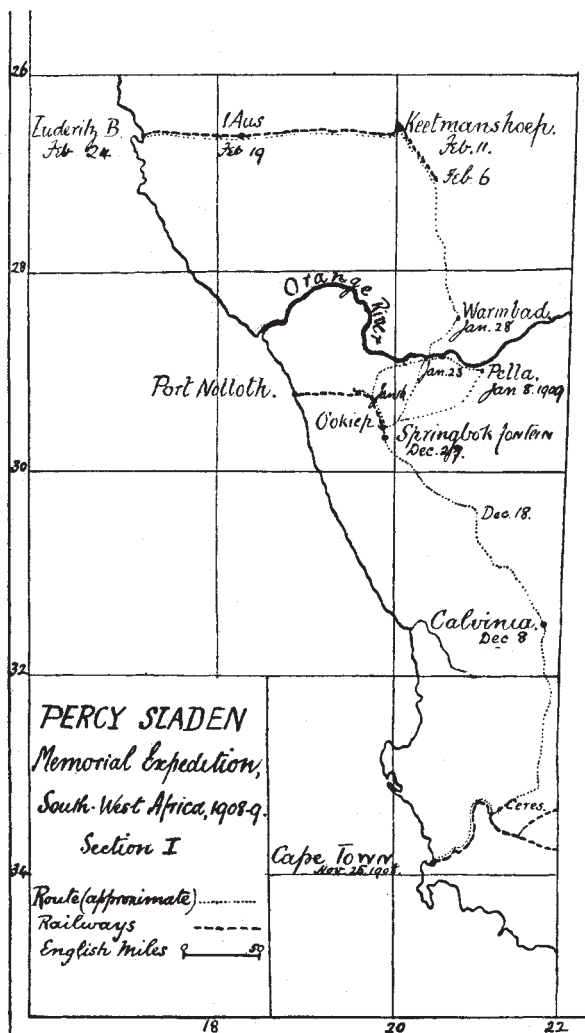
From O'okiep a detour to the north-east across the sandy plains of Bushmanland was rewarded by an unexpectedly rich collection, for unusually heavy rains had recently fallen. The plains were gay with the flowers of *Hoodia Gordonii*, *Rhigozum* sp., and a tall bushy *Hermannia*. A shrubby *Aristida* and some smaller species of the same genus were also very abundantly represented, while trees of *Aloe dichotoma* and large symmetrical bushes of species of *Euphorbia* were conspicuous on the "kopjes." The natural vegetation along the banks of the Orange River forms a narrow belt, in which a distinct arrangement in subordinate zones can usually be traced. The lowest zone (Fig. 1) consists of a dense scrub of *Salix capensis*, *Acacia horrida*, *Zizyphus mucronata*, and a few other bushes, with some grasses, reeds, and sedges. Above the primary bank of the river the mountains rise steep, rugged and barren, or, between them and the stream, are stony flats (Fig. 1) all but devoid of vegetation. Having returned to O'okiep to refit, we arrived at Raman's Drift for the second time on January 22, and crossed to the German side on January 24. The river at this time was in flood, and its muddy waters were some



FIG. 2.—Great Namaqualand south of Warmbad, *Aloe dichotoma*, *Euphorbia* sp. The native is a Bondelzwart.

600 yards wide at the drift. A few hours of heavy travelling brought us upon a plateau (2300-4000 feet)

where the vegetation proved to be richer than any hitherto met with. It was said that the rains which had fallen a few months earlier were more copious than any experienced during the previous fifteen or twenty years. It was no doubt a consequence of this that the annual constituents of the flora were unexpectedly abundant. Warmbad is noted for a number of warm springs (35° C.) the waters of which—like so many of the natural waters of the south-west coast—are impregnated with sulphuretted hydrogen. The railway between Keetmanshoep (3300 feet) and the sea ascends to nearly 5000 feet at !Aus, where the vegetation presents many karoid features. From !Aus the descent—at first gradual, later more rapid—is uninterrupted. About 30 km. west of !Aus (110 km. from the coast) the desert commences very abruptly at 2700



feet. In this latitude there appear to be few forms peculiar to the desert itself and its flora consists very largely of the more resistant of the species found at higher levels and under less arid conditions. Nevertheless, the eastern boundary of the desert is remarkably sharp, and approximately coincides with the western limit of precipitation from clouds condensed upon the neighbouring highlands. Within 50 km. of the sea the sharp, bare mountain peaks and ridges are frequently more or less buried in sand-dunes, the materials of which are blown up from the lower-lying flats, leaving behind the worn gravels from which diamonds are now being obtained over an extensive area. Nearer the coast the scenery is remarkably gaunt and rugged and the wind-swept surface is frequently quite bare of vegetation.

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Leaving Lüderitzbucht by sea on February 26, I arrived in Swakopmund eighteen hours later, and on March 2 reached Welwitsch (lat. 22°), a Welwitschia locality previously visited in 1907 in company with Mr. E. E. Galpin.¹ The object of this visit was to obtain later stages of the Welwitschia embryo than were present in material collected in 1907. The flora in general was this year very much poorer than two years earlier. Not only were many of the smaller plants then collected not found at all, but woody species formerly obtained in flower or fruit now showed no signs of reproductive activity; this also applies to some extent to Welwitschia itself, for only a small proportion of the plants had coned. The explanation of this very striking difference seems to be contained in the meteorological records. Between² November 1, 1906, and January 31, 1907, 12.8 mm. of rain were measured at Welwitsch; in the corresponding period of 1908-9 the rainfall was 5.9 mm. In December, 1906, the fall was 12.5 mm., an amount very much in excess of that recorded for the whole of each of the years 1907 and 1908. We have here, then, another example of the remarkable influence of a small additional rainfall upon both the annual and perennial constituents of a desert flora.

A large number of the Welwitschia plants present in 1907 in this easily accessible locality have been removed in the interval, and, at the same rate, a few years would probably have seen the complete disappearance of all plants from the vicinity of the railway, for there is here no sign of seed-reproduction. It is therefore very satisfactory to note that His Excellency the Acting Governor has issued instructions for the protection of the plants that remain.

H. H. W. PEARSON.

RESEARCHES ON THE ACTION CENTRES OF THE ATMOSPHERE.³

IN the domain of world meteorology, that is, the comparison and discussion of meteorological data of widely distributed stations over the earth's surface, Prof. H. Hildebrand Hildebrandsson has, during the last decade or so, been making some very important communications. He has clearly emphasised the fact that the laws which rule the general movements of our atmosphere will never be found if observations are only made in civilised countries on the earth's surface. Our atmosphere is a mass of air resting both on the continents and the oceans, and modern researches have shown that a large perturbation at one time in one area may be intimately associated with a perturbation of an opposite nature in the antipodal part of the world. Although several workers many years ago intimated the positions of isolated areas which behaved in a reverse or see-saw manner meteorologically, it was Prof. Hildebrandsson who first directed attention to a great number of such areas. In more recent times these isolated instances of barometric see-saws have been found to be part of really one general law applying to the movements of our atmosphere. This general law has yet to be more minutely investigated, for it is, as Prof. Hildebrandsson states, "une vérité avec des grandes modifications." There is little doubt, nevertheless, that world meteorology has made a considerable advance since the discovery of these simultaneous reverse-pressure changes, and one is now in a much better position to state where on the earth's surface observations should be made.

Every attempt should therefore be made to utilise islands in the large oceans, even if the sole occupants of the islands are the meteorological observers themselves, for until the air movements over the oceans are carefully observed and recorded we shall still be left to a great extent in the dark.

Prof. Hildebrandsson's most recent memoir deals chiefly with the northern latitudes of the northern hemisphere, and is devoted to a discussion of data with respect to the simultaneous compensation between types of seasons in different regions. The meteorological data here dealt with relate mainly to certain regions between the east coast of

¹ NATURE, vol. lxxv., p. 536.

² Meteorological observations at this station were commenced in November, 1906.

³ Kungl. Svenska Vetenskapsakademiens Handlingar, Band 45, No. 2. III. "Sur la Compensation entre les Types des Saisons simultanées en différentes Régions de la Terre." By H. Hildebrand Hildebrandsson.